

AGE WISE COMPARISON OF HEMATOLOGICAL, BIOCHEMICAL AND HORMONAL PARAMETERS OF SAHIWAL

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ABSTRACT

A study comprising 48 animals was carried out to analyze the various hematological, biochemical and hormonal parameters in various age group viz. 0-1 year, 1-2 year, 2-3 year and >3 year. Lymphocytes, neutrophils, BUN, chloride, potassium, MCHC, total protein, ALT, total bilirubin, direct bilirubin and prolactin were not statistically different in various age groups. Significantly higher levels of TLC, Hct, TEC, triglycerides, glucose, ALP and sodium were observed in animals of 0-1 year age group. In animals of 1-2 year age group statistically significant higher values of monocytes, MCH, calcium, albumin, AST and TSH were observed. Higher values for hemoglobin, creatinine, T3, T4 and progesterone were recorded in animals of age group 2-3 year. However, MCV and estrogen reference values were recorded highest in age group >3 year.

KEYWORDS: Sahiwal, Hematology, Biochemistry & Hormonal

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INTRODUCTION

Sahiwal cattle are renowned milch breed that are indigenous to Pakistan and India. Lofty milk production, disease resistance, low maintenance cost and better endurance for hot climate, they are characterized as one of the most useful animals in India (Muhuyi *et al.*, 1999 and Narwaria *et al.*, 2015). Thus, Sahiwal cattle enjoy a good share in total dairy production of India. Hematological, biochemical and hormonal profile are important bioindicator of the physiological state of those cattle. These parameters may also be used as diagnostic tool for analyzing reproductive and productivity disorders (Virmani *et al.*, 2011). So, it becomes important to establish the normal reference values of the cattle at different age groups as it may aid in clinical diagnosis. However, less formal attempt has been made to establish the complete hematological, biochemical and hormonal profile of Sahiwal breed. Hence, the present study dealt with the age wise determination of reference values for various hematological, biochemical and hormonal parameters.

MATERIAL AND METHODS

The hematological profile was prepared for Hemoglobin (Hb), Total Leucocyte Count (TLC), Differential Leucocyte Count (DLC), Packed Cell Volume (PCV), Total Erythrocyte Count (TEC), Mean Corpuscular Hemoglobin (MCH), Mean Corpuscular Hemoglobin Concentration (MCHC) and Mean Corpuscular Volume (MCV). The biochemical assessment was based on assay of Sodium, Potassium, Chloride, Blood urea nitrogen (BUN), Creatinine, Glucose, Calcium, Total protein, Albumin, Alkaline phosphatase (ALP), Alanine amino

transferase (ALT), Aspartate amino transferase (AST), Bilirubin (total and direct) and triglycerides parameters. The hormonal parameters evaluated were T₃, T₄, TSH, Estrogen, Progesterone and Prolactin.

Collection of Blood Sample

Animals were randomly chosen from each strain/breed and were divided into four groups according to their age i.e. 0-1 year, 1-2 years, 2-3 years and above 3 years of age. The blood samples were collected by jugular venipuncture from each animal two times fortnightly in two set of sterile vials/vacutainers; one coated with EDTA (for hematology), an additional coated with Sodium fluoride/Citrate buffer, the anti-glycolysis anticoagulant composition for Glucose estimation and another one without any coating for serum collection (for biochemical and hormonal evaluation).

Hematological Panel

After collection of blood sample by jugular venipuncture in a sterile EDTA coated vial, the samples were analyzed for different hematological parameters in Automatic analyserMS4.

Biochemical Panel

Blood samples were collected in glass beaded sterile vial without any anticoagulant and serum was harvested by centrifugation at 3000 rpm for 20 minutes and then stored at -20°C. Biochemical parameters i.e. BUN, Creatinine, Glucose, Calcium, Total protein, Albumin, ALP, ALT, AST, Bilirubin (total and direct) and triglycerides were analyzed with EM 200TM analyzer using commercially available Transasia XL system pack kits procured from M/S Transasia Biomedical Limited, Mumbai. Sodium, potassium and chloride were analyzed by automatic electrolyte analyser, EasyliteTM.

Hormonal Panel

Hormonal parameters i.e. T₃, T₄, TSH, Estrogen, Progesterone and Prolactin were analyzed with SPECTROstar® BMG Labtechmicroplate reader using commercially available CALBIOTECH ELISA kits.

Statistical Analysis

The reported data having the arithmetic mean of twelve replicates was subjected to ANOVA to determine the significant differences among different age groups at 0.05 % level of significance.

RESULTS AND DISCUSSIONS

Hematological Parameters

The hemoglobin level was significantly higher in animals of group 1-2 year and 2-3 year age groups as compared to 0-1year and >3 years age groups. However, Chandra *et al.* (2012) reported higher mean levels of Hb in Sahiwal. Significantly higher TLC level for 0-1 year age group as compared to >3 years age group has been recorded. However, Aarifet *al.* (2013) observed still lower value for Sahiwal cattle. However, the lymphocyte %, neutrophil % and MCHC level did not differ significantly in various age groups (Table 1). The monocyte % was observed to be significantly higher for >3 year age group as compared to rest of the three age groups. While the Hct % was significantly higher for 0-1 year age group as compared to rest of three age groups. The sustenance of Hct over the entire period of study in all the groups shows comparable heat tolerance and resilience of the sample population (Sreedhar *et al.*, 2013). However, the findings of present study may be supported by the observations made by Roy *et al.* (2010). The lower TEC level for >3 years age groups as compared to other three age groups can be stamped by the findings of Chandra *et al.* (2012). Significantly lower

MCH level for 0-1 year as compared to other three age groups can be advocated by Roy *et al.* (2010). The MCV level were significantly higher for >3 year as compared to 0-1 year age group. Pampori *et al.* (2015) discussed relation of MCV and PCV on the premise that probably indigenous cattle have larger erythrocyte volume with high corpuscular volume.

Biochemical Parameters

The sodium level was significantly lower for 2-3 years as compared to other three groups which were similar while significantly higher creatinine level for the same age group cattle has been recorded. The higher value of sodium level in age group of 2-3 year is suggestive of preparative dynamics of the animal evolving to be a dairy purpose sentient being. The higher level of creatinine at age group 2-3 years marks the presence of stable muscle mass at this age as stated by Virgili *et al.* (1994). The potassium, chloride, total protein, BUN, total bilirubin level, direct bilirubin level and ALT level did not differ significantly in different age wise groups (Table 2). The equivalent concentrations of chloride across different age groups agree well with observation of Murtuza *et al.* (1979). The equivalence in total protein concentration amongst all the groups is pedestaled upon the similar level of fiber and starch in the diet for entire livestock sample considered for this study giving rise to production of comparable concentrations of propionic acid in the rumen and an similar microbial protein supply in all the animals sampled (Heck *et al.*, 2009). The glucose level was significantly lower for >3 year age group as compared to other three age groups. As blood glucose concentration in mature ruminants are substantially lower than those in non-ruminants and new born ruminant has blood glucose value similar to those of non-ruminant mammals. These values decrease sharply during the 1st few weeks of life as rumen function develops and then decrease more slowly (Beitz, 2005). Significantly higher level of calcium and albumin for 1-2 year age group as compared to other three age groups has been observed. The ALP level was significantly lower for >3 year age group as compared to other three age groups which were similar. The AST level was significantly higher for 1-2 and 2-3 year age group as compared to 0-1 year age group that can be supported by findings of Chandra *et al.* (2012). The level of triglyceride was significantly higher for 0-1 year age group as compared to >3 year age group that was found to be in agreement with Khan *et al.* (2011).

Hormonal Parameters

The T₃ and T₄ level was significantly higher for 2-3 year age group as compared to >3 year age group. The result of present study gain credence from the reported higher T₃ levels with better productivity and cyclicity in cattle (Ali *et al.*, 2012). The TSH level was significantly higher for 1-2 year and >3 year age group as compared to 0-1 year and 2-3 year age group (Table 3). However, much higher values of TSH have been reported by Fiore *et al.* (2015). The estrogen and prolactin level did not differ significantly in various age wise groups. The progesterone level was significantly higher for 2-3 year age group as compared to other three age groups. Age specific results are in correspondence with the findings of Gomes and Erb (2004).

CONCLUSIONS

Non- significant reference values at different age groups has been observed in case of lymphocytes, neutrophils, BUN, chloride, potassium, MCHC, total protein, ALT, total bilirubin, direct bilirubin and prolactin. However other parameters revealed significant changes as per different age groups. However, the study also leaves an avenue of further work by subgrouping the animals based on their reproductive and physiological stages.

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Table 1: Age Wise Hematological Profile of Sahiwal Cattle. N= 12 in Each Age Group

Parameters	0-1 Year	1-2 Year	2-3 Year	Above 3
Hemoglobin (g/dl)	10.32 ^b ± 0.53	11.66 ^a ± 0.46	11.83 ^a ± 0.43	10.16 ^b ± 0.43
TLC (× 10 ³ /mm ³)	11.32 ^a ± 1.08	9.92 ^{ab} ± 0.92	9.22 ^{ab} ± 0.55	7.57 ^b ± 0.45
Lymphocytes (%)	66.83 ± 1.86	62.08 ± 3.28	66.25 ± 3.24	61.33 ± 2.86
Monocytes (%)	2.83 ^b ± 0.21	3.83 ^b ± 0.46	3.58 ^b ± 0.36	5.00 ^a ± 0.49
Neutrophils (%)	30.33 ± 1.81	34.08 ± 3.50	30.17 ± 3.50	33.67 ± 3.19
Hct (%)	38.39 ^a ± 2.81	27.74 ^b ± 4.05	28.67 ^b ± 2.41	27.22 ^b ± 1.97
TEC (× 10 ⁶ /mm ³)	9.95 ^a ± 0.52	8.76 ^a ± 0.79	8.69 ^a ± 0.29	7.20 ^b ± 0.30
MCH (pg)	11.35 ^b ± 0.29	15.37 ^a ± 1.16	14.66 ^a ± 0.60	15.08 ^a ± 0.35
MCHC (g/dl)	30.62 ± 0.58	35.92 ± 2.54	38.41 ± 3.60	34.84 ± 2.47
MCV (fl)	43.67 ^c ± 0.75	46.47 ^b ± 0.48	48.56 ^b ± 0.75	52.86 ^a ± 1.13

The value (Mean ± S.E.) with different superscript in each row differ significantly (P < 0.05).

Table 2: Age Wise Biochemical Profile of Sahiwal Cattle. N= 12 in Each Age Group

Parameters	0-1 Year	1-2 Year	2-3 Year	Above 3
Sodium (m mol/L)	144.78 ^a ± 1.27	144.10 ^a ± 1.17	140.37 ^b ± 0.41	143.65 ^a ± 0.81
Potassium (m mol/L)	4.98 ± 0.28	5.14 ± 0.17	4.73 ± 0.06	4.88 ± 0.11
Chloride (m mol/L)	107.93 ± 0.86	108.15 ± 1.48	106.35 ± 0.78	106.69 ± 0.65
BUN (mg/dl)	19.59 ± 1.84	19.75 ± 2.14	22.36 ± 1.06	24.89 ± 1.68
Creatinine (mg/dl)	1.28 ^b ± 0.04	1.43 ^b ± 0.07	1.63 ^a ± 0.06	1.27 ^b ± 0.05
Glucose (mg/dl)	76.25 ^a ± 3.60	69.93 ^a ± 2.83	66.36 ^a ± 4.90	52.58 ^b ± 1.84
Calcium (mg/dl)	7.85 ^b ± 0.44	8.70 ^a ± 0.29	7.51 ^b ± 0.17	7.37 ^b ± 0.16
Total Protein (g/dl)	7.97 ± 0.39	9.32 ± 0.96	9.07 ± 0.82	9.47 ± 0.53
Albumin (g/dl)	3.19 ^b ± 0.05	3.43 ^a ± 0.06	3.26 ^{ab} ± 0.05	3.31 ^{ab} ± 0.07
ALP (IU/L)	122.17 ^a ± 5.13	117.42 ^a ± 5.32	116.83 ^a ± 7.33	97.58 ^b ± 6.68
AST (IU/L)	100.87 ^b ± 3.66	118.49 ^a ± 4.26	116.52 ^a ± 3.40	109.52 ^{ab} ± 1.75
ALT (IU/L)	49.27 ± 3.71	62.81 ± 5.84	55.51 ± 5.05	58.12 ± 4.27
Total Bilirubin (mg/dl)	0.113 ± 0.009	0.107 ± 0.01	0.129 ± 0.01	0.112 ± 0.01
Direct Bilirubin (mg/dl)	0.099 ± 0.008	0.096 ± 0.01	0.099 ± 0.01	0.075 ± 0.007
Triglycerides (mg/dl)	28.50 ^a ± 3.38	20.25 ^b ± 1.63	21.75 ^b ± 1.61	10.67 ^c ± 1.37

The value (Mean ± S.E.) with different superscript in each row differ significantly (P < 0.05).

Table 3: Age Wise Hormonal Profile of Sahiwal Cattle. N= 12 in Each Age Group

Parameters	0-1 Year	1-2 Year	2-3 Year	Above 3
T ₃ (ng/ml)	0.99 ^{ab} ± 0.12	1.04 ^{ab} ± 0.05	1.30 ^a ± 0.18	0.84 ^b ± 0.06
T ₄ (ng/ml)	13.96 ^b ± 1.08	15.70 ^{ab} ± 0.73	17.36 ^a ± 1.31	14.16 ^b ± 0.52
TSH (μIU/ml)	0.84 ^b ± 0.06	5.90 ^a ± 1.67	1.05 ^b ± 0.23	5.82 ^a ± 1.62
Estrogen (pg/ml)	12.83 ± 6.38	11.59 ± 2.31	14.39 ± 4.28	15.39 ± 4.95
Progesterone (ng/ml)	0.33 ^b ± 0.05	0.45 ^b ± 0.09	2.07 ^a ± 0.72	0.71 ^b ± 0.19
Prolactin (ng/ml)	0.20 ± 0.01	0.19 ± 0.01	0.20 ± 0.02	0.19 ± 0.008

The value (Mean ± S.E.) with different superscript in each row differ significantly (P < 0.05).

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